ID30 - AUTONOMOUS ACOUSTIC SURVEILLANCE SYSTEM FOR NEARSHORE SOUNDSCAPING

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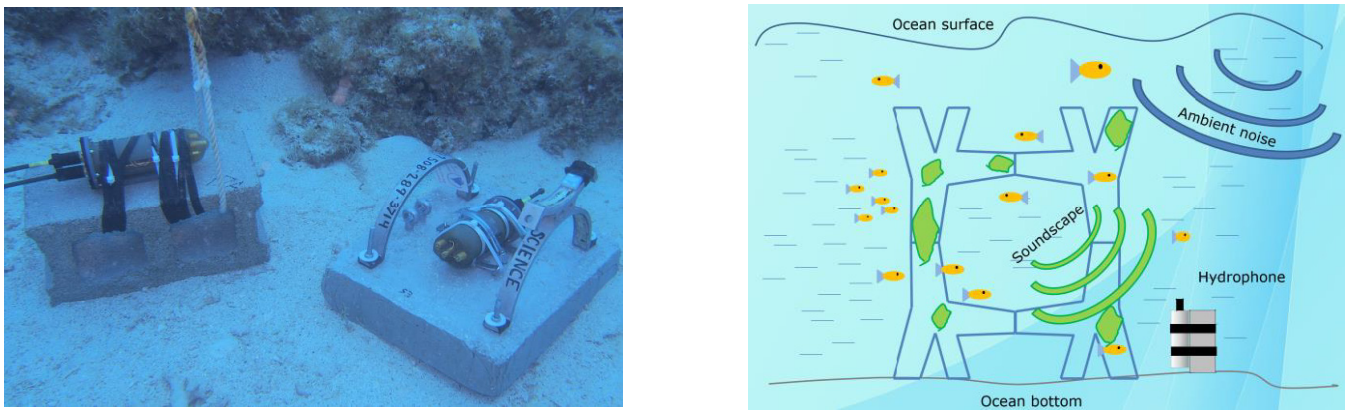
Abstract

In response to global climate change and growing industry capabilities, researchers are looking for robust and soft engineered solutions for nearshore ecosystems. A newly developed Multifunctional Artificial Reef is capable of performing several functions within one structure, among which is marine ecosystem restoration and the support for various sensors for structural and environmental monitoring. Combining such functionalities, implementation of passive acoustic shows great potential for biodiversity monitoring and colonization process observation of recently deployed artificial structure. Therefore, by integrating moored hydrophone within the artificial reef system and setting recording mode as well as post processing optimization, peculiar features of local marine habitat behaviour will be researched in order to provide better insight on the contribution of these structures for ecosystems preservation.

Keywords – Artificial reef, passive acoustics, ecosystem restoration.

Nowadays human population increase, associated with development of residential, industrial and recreational development, as well as severe weather conditions caused by global climate change, are inevitably becoming a key contributor to habitat loss and environmental degradation. Among numerous strategies aimed at preserving the existing biodiversity, one that is currently considered as very efficient consists on building underwater artificial reefs. The so-called Multifunctional Artificial Reef (MFAR) is currently seen as a tool with great potential for marine biodiversity restoration and rehabilitation, coastal protection and erosion prevention, and as a scientific platform supporting various sensors able to self-monitoring and sensing ambient environment, see Fig. 1. Modularity of the MFAR, parametrically designed reef parts, harsh and complex environmental loadings, remote positioning along with the growing complexity of the MFAR construction and instrumentation are joined in one underwater system.

One of the main system functionalities is serving as a platform to collect data for the better understanding of ecosystems using passive acoustic sensing of marine environment soundscape and biological monitoring. Due to the complexity deriving from reef positioning in remote areas, the only possible solution for observation of biological presence is the passive acoustic methods, which have been proven to be an effective tool and various applications were found on monitoring of soundscaping generated by local assemblage of soniferous species and ambient noise. It was found that short, daytime recordings from coral reefs, identified positive correlations between coral cover, fish density, and sound intensity. In addition, passive acoustic approach may be considered as relatively straightforward when applied to prospective reef structure from the hardware perspective, as it was shown that sole recording hydrophone on the study site is capable to record sufficient information for later analysis. The ongoing research has been dedicated to sensor integration, choosing the recording mode of the hydrophone and studying possibilities to apply postprocessing for better estimation of present biodiversity.



(a) ***(b)***

Fig 2. Typical hydrophone mooring for marine habitat acoustic monitoring: (a) moored setup for coral reef recordings, (b) in close proximity to the prospective MFAR.